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(54) **Optical pickup apparatus and identification apparatus for identifying the type of optical record medium**

Optisches Abtastgerät und Identifizierungsgerät zum Identifizieren des Typs eines optischen Aufzeichnungsmediums

Appareil de lecture optique et appareil d'identification pour identifier le type d'un support d'enregistrement optique

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- **PATENT ABSTRACTS OF JAPAN vol. 017, no. 366 (P-1571), 9 July 1993 (1993-07-09) -& JP 05 054406 A (MATSUSHITA ELECTRIC IND CO LTD), 5 March 1993 (1993-03-05)**

Description

[0001] The present invention generally relates to an identification apparatus for identifying the type of optical record medium used for the optical pickup apparatus.

[0002] There is a multi-disc player, which can reproduce a CD (Compact Disc) and a LD (Laser vision Disc) etc., as a reproducing apparatus able to reproduce a plurality of types of optical record media.

[0003] In this kind of multi-disc player, in order to realize an optical system optimum for each of the optical discs, which thicknesses, refraction coefficients, etc., of their disc protection layers or their disc substrates are different from each other, a plurality of optical pickup apparatuses, each of which is exclusive for one of the optical discs of various types, are provided and are selectively used in accordance with the loaded optical disc to be reproduced. Thus, the optimum reproduction operation can be performed with respect to each of various types of optical discs by one multi-disc player.

[0004] In this kind of multi-disc player, in case of identifying the types of optical discs which disc thicknesses are different from each other, a mechanical switch is provided so as to identify the type of the loaded optical disc on the basis of the fact that this mechanical switch is pressed or not by the loaded optical disc. Further, in case of identifying the types of optical discs which external shapes e.g. the external diameters are different from each other, an optical detection device such as a light sensor is equipped to detect the existence and non-existence of the reflection light reflected by the loaded optical disc.

[0005] However, since a plurality of optical pickup apparatuses, each of which is exclusive for one of the optical discs of various types, are equipped in the above mentioned multi-disc player, the size and cost of the apparatus is increased, which is a serious problem in the practical sense.

[0006] In order to overcome this problem, it may be proposed to use one optical pickup apparatus commonly for a plurality of optical discs of various types. However, once the thickness of the protection layer (substrate) is far off from the optimum thickness set for each of the optical pickup apparatus, a spherical aberration is generated in the focussed light beam as the reading light beam at the information record plane of the optical disc, which is another serious problem to perform a precise reproduction operation.

[0007] More concretely, assuming that the wavelength of the reading light beam emitted from a laser diode is λ, the refraction coefficient of the protection layer of the optical disc is n, the difference between the actual thickness of the protection layer of the optical disc and the optimum thickness of the protection layer set for the optical pickup apparatus is Δd, and the numerical aperture of the objective lens is NA, the spherical aberration W_{40} is expressed by a following expression (1).

$$W_{40} = \{(n_2 - 1)/8n^3\} * \Delta d * (NA^4/\lambda) \qquad (1)$$

[0008] Thus, as the difference Δd is increased, the spherical aberration W_{40} is also increased and the signal quality of the read out signal of the optical pickup apparatus is degraded, which is the problem.

[0009] Further, the above mentioned mechanical or optical identification apparatus for identifying the type of the loaded optical disc cannot identify the type of the loaded optical disc, if the thicknesses and refraction coefficients of the optical discs are substantially same to each other but only the distances from the surfaces of the protection layers to the information record planes are different from each other. In this case, a complicated identifying operation such as a comparison of record formats etc., will be necessary.

[0010] More concretely, those identification apparatuses cannot differentiate a first optical disc of both sides recording type produced by bonding two discs each of which has a protection layer with 0.6 mm thickness, from a second optical disc of one side recording type, which has an external diameter same as the first optical disc and which has a protection layer with 1.2 mm thickness, which is the problem.

[0011] By the way, in the above mentioned optical pickup apparatus, the spot diameter of the reading light beam is set to be a value optimum for the size of the information pit of the optical record medium to be reproduced.

[0012] The spot diameter R of the reading light beam is proportional to the numerical aperture NA of the objective lens and the wavelength λ of the reading light beam. Namely, the spot diameter satisfies a following expression (2).

$$R \propto \lambda/NA \qquad (2)$$

[0013] Therefore, in case of reproducing the optical record medium which has an information pit of relatively small size, in order to make the spot diameter R of the reading light beam smaller correspondingly, the numerical aperture NA of the objective lens is increased assuming that the wavelength λ of the reading light beam is constant.

[0014] In other words, assuming that the wavelength λ of the reading light beam is constant, as the numerical aperture NA is increased, the smaller information pit can be reproduced, while, as the numerical aperture NA is decreased, the larger information pit can be reproduced.

[0015] The numerical aperture NA of the objective lens has a peculiar value for each objective lens. Thus, the optical pickup apparatus, which is adjusted to be optimum with respect to a first information pit having a certain size, is not suitable for a second information pit having a size different from that of the first information pit.

Therefore, the distortion will be generated in the reproduction signal if this optical pickup apparatus is used with respect to an optical record medium formed with the second information pit, which is a problem in this case.

[0016] In this manner, it is not possible for one optical pickup apparatus to reproduce optical discs which sizes of the information pits are different from each other. Even if the reproduction is performed in such a condition, the precise reproduction operation is not possible, which is the problem.

[0017] It is therefore an object of the present invention to provide an identification apparatus for identifying the type of optical disc loaded on such an information reproducing apparatus.

[0018] In J P 05 054406 A, there is shown an identification apparatus for identifying a type of optical record medium loaded on an information reproducing apparatus among at least first and second type optical record media which have distances from surfaces to information record planes different from each other, said information reproducing apparatus comprising: an objective lens for focussing a reading light onto the information record plane of the loaded optical record medium; and a focus coil for driving said objective lens in a focussing direction.

[0019] According to the present invention such an identification apparatus further comprises:

a detection means for detecting a voltage corresponding to a current, which flows through the focus coil when a focussing condition is optimum, and outputting a voltage signal indicating the detected voltage;

a low pass filter for passing a low frequency component of the voltage signal and outputting a low frequency component signal; and

a comparison means for comparing a voltage of the low frequency component signal with at least one standard voltage, which is set in advance based on the distances from the surfaces to the information record planes of said first and second optical record media, and for outputting an disc identification signal, which indicates the type of said loaded optical record medium, on the basis of a result of comparing.

[0020] According to the identification apparatus of the present invention, the voltage corresponding to a current, which flows through the focus coil when a focussing condition is optimum, is detected and outputted as the voltage signal by the detection device. Then, the low frequency component of the voltage signal is passed or extracted and outputted as the low frequency component signal by the low pass filter. Then, the voltage of the low frequency component signal is compared with the standard voltage by the comparison device, and the disc identification signal is finally outputted by the comparison device on the basis of the result of comparing. Since the standard voltage is set in advance based on the distances from the surfaces to the information record planes of the first and second optical record media, and since the voltage detected by the detection device corresponds to the current, which flows through the focus coil when the focussing condition is optimum, the types of optical record media which have distances from surfaces to information record planes different from each other can be easily and reliably identified according to the identification apparatus of the present invention.

[0021] The nature, utility, and further features of this invention will be more clearly apparent from the following detailed description with respect to preferred embodiments of the invention when read in conjunction with the accompanying drawings briefly described below.

FIG. 1 is a block diagram of an optical pickup apparatus as a first example;

FIG. 2A is a block diagram of a disc identifying sensor used for the optical pickup apparatus of FIG.1, FIG. 2B is a diagram explaining a stroke with respect to the DVD in the optical pickup apparatus of FIG. 1, and FIG. 2C is a diagram explaining a stroke with respect to the CD in the optical pickup apparatus of FIG. 1;

FIG. 3 is a table for explaining an operation of the optical pickup apparatus of FIG. 1; and

FIG. 4 is a block diagram of an optical pickup apparatus as a second example;

FIG. 5 is a partial cross sectional view of a slit plate, an actuator movable member and an objective lens in an optical pickup apparatus of the second example;

FIG. 6 is a magnified partial plan view of an optical disc in the second example;

FIG. 7 is a diagram for explaining the correction in a light intensity distribution according to the second example;

FIG. 8 is another diagram for explaining the correction in the light intensity distribution according to the second example;

FIG. 9 is a plan view of a glass filter used in a third example;

FIG. 10 is a plan view of a light intensity distribution correction element in a fourth example;

FIG. 11 is a plan view of a light intensity distribution correction element in a fifth example;

FIG. 12 is a block diagram of an optical system in a sixth example; and

FIG. 13 is a block diagram of an optical system in seventh example.

(1) First Example

[0022] FIG. 1 shows a construction of an optical pickup apparatus as a first example, which is equipped in

an optical disc player.

[0023] In FIG. 1, an optical pickup apparatus 1 is provided with: a semiconductor laser diode 2 for emitting a reading light; a grating 3 for separating the reading light into three beams; a half mirror 4 for reflecting and guiding the reading light from the laser diode 2 toward the side of an objective lens 9, and transmitting the reading light from the side of the objective lens 9 toward a light receiving element 11; a collimator lens 5 for converting the reading light which is a diffused light to a collimated light; a correcting element 6 for correcting the spherical aberration consisting of a spherical lens, a Fresnel lens, etc.; a driving mechanism 7 for moving the correction element 6; a driving circuit 8 for driving the driving mechanism 7 to move the correction element 6 into the optical path and move the correction element 6 out of the optical path, by outputting a driving control signal Sdr on the basis of a control signal Sc to the driving mechanism 7; the objective lens 9 for condensing and focussing the reading light onto an optical disc 101; a concave lens 10 for shaping the reading light, which is transmitted from the objective lens 9 through the half mirror 4; and the light receiving element 11 for receiving the reading light shaped by the concave lens 10, converting it to an electrical signal and outputting it as a detection signal Sdet.

[0024] The optical disc player is provided with a disc identifying sensor 12, as one example of a disc identification apparatus, for identifying the type of the optical disc 101 and outputting a disc identification signal Sd indicating the identified type of the optical disc 101.

[0025] The optical pickup apparatus 1 is further provided with a control circuit 13 for generating the control signal Sc for controlling the moving in and out operation of the correction element 6 on the basis of the disc identification signal Sd.

[0026] The optical disc player is further provided with: a signal process unit 14 for performing a predetermined signal process of the detection signal Sdet from the light receiving element 11, and a servo control unit 15 for performing servo controls such a focus servo control, a tracking servo control, a spindle servo control, etc., by generating servo control signals Sser on the basis of the signal processed by the signal process unit 14.

[0027] The three lights separated by the grating 3 are applied onto one record track of the optical disc 101 to form three light spots arranged along one record track and slightly spaced from each other so as to allow the optical pickup apparatus 1 to use one of the reflection lights from those three light spots which is in the best optical condition among the three reflection lights.

[0028] Here, a construction of the disc identifying sensor 12 is explained with referring to FIG. 2.

[0029] The disc identifying sensor 12 is provided with: a low pass filter 12A for passing only a low frequency component of the electric current flowing through a focus coil, which drives the objective lens 9 in the direction of focussing, and outputting it as a low frequency component signal having a voltage Vdc; and a comparator 12B for comparing the voltage Vdc of the low frequency component signal with a standard voltage Vref, and generating the disc identification signal Sd based on the result of the comparison.

[0030] In case of identifying two types of optical discs, one of which is the DVD (Digital Video Disc) made by bonding two discs each having the protection layer (substrate) thickness of 0.6 mm as shown in FIG. 2B, and the other of which is the CD (Compact Disc) having the protection layer thickness of 1.2 mm as shown in FIG. 2C, the voltage Vdc of the low frequency component signal corresponding to the protection layer thickness of 0.9 mm (=(0.6 + 1.2)/2 mm) is set as the standard voltage Vref in the disc identifying sensor 12, for example.

[0031] Since the protection layer of the optical disc has a refraction coefficient n, a stroke (driving distance) d of the objective lens 9 is substantially proportional to "t/n" in case that the incident angle of the light beam is relatively small, wherein t represents the thickness of the protection layer. Thus, assuming that the focus position is at the surface of the protection layer when the focus servo is not performed, the driving distance d of the objective lens 9 when the focus servo is closed with respect to the DVD as shown in FIG. 2B, and the driving distance 2d of the objective lens 9 when the focus servo is closed with respect to the CD as shown in FIG. 2C, are different from each other by two times (= 1.2 / 0.6 times).

[0032] Therefore, by adjusting the focus position to be at the surface of the protection layer when the focus servo is not performed, the disc identifying sensor 12 outputs the disc identification signal Sd, which indicates that the identified disc type is the CD, if the voltage Vmdc obtained as the voltage Vdc of the low frequency component signal exceeds the standard voltage Vref, and outputs the disc identification signal Sd, which indicates that the identified disc type is the DVD if the voltage Vmdc does not exceeds the standard voltage Vref.

[0033] In the explanations hereinbelow, the standard voltage Vref is set as the above explained manner.

[0034] Next, the operation of the optical pickup apparatus 1 will be described with referring to FIGS. 1 to 3.

[0035] In advance of the information reproduction operation, the optical pickup apparatus 1 closes the focus servo to get the reading light focussed on the information record plane of the optical disc 101.

[0036] By this, the low pass filter 12A passes only the low frequency component of the voltage signal corresponding to the electric current flowing through the focus coil for driving the objective lens 9 in the focussing direction, and outputs it as the low frequency component signal having the voltage Vdc to the comparator 12B in FIG. 2A. By this, the comparator 12B compares the voltage Vdc of the low frequency component signal with the standard voltage Vref and outputs the disc identification signal Sd corresponding to the identified type of the optical disc 101, which is loaded on the optical disc player

in FIG. 2A.

[0037] More concretely, if the voltage Vmdc obtained as the voltage Vdc of the low frequency component signal exceeds the standard voltage Vref, the disc identifying sensor 12 outputs the disc identification signal Sd, which indicates that the identified disc type is the CD, to the control circuit 13. If the voltage Vmdc does not exceeds the standard voltage Vref, the disc identifying sensor 12 outputs the disc identification signal Sd, which indicates that the identified disc type is the DVD, to the control circuit 13.

[0038] By this, the control circuit 13 outputs the control signal Sc to the driving circuit 8 to control the moving in and out operation for the correction element 6 on the basis of the disc identification signal Sd in FIG. 1.

[0039] As a result, the driving circuit 8 outputs the driving control signal Sdr to the driving mechanism 7 on the basis of the control signal Sc, so as to move the correction element 6 into or out of the optical path in accordance with the disc identification signal Sd.

[0040] More concretely, it is assumed that the optical system of the optical pickup apparatus 1 is set to be suitable for the CD when the correction element 6 is not in the optical path. When the disc identification signal Sd indicates the CD, the correction element 6 is not moved if it is not in the optical path, and is moved out of the optical path if it is in the optical path, as shown in FIG. 3.

[0041] On the other hand, when the disc identification signal Sd indicates the DVD, the correction element 6 is moved into the optical path if it is in the optical path, and is not moved out if it is already in the optical path.

[0042] As described above in detail, according to the first example, the type of the loaded optical disc is detected just by the difference in the thickness of the protection layer, and the optimum aberration correction is performed for the identified type of the optical disc, so that the optimum reproduction operation for the loaded optical disc can be easily performed.

[0043] In the above first example, the explanation has been made for the case of identifying two types of the optical discs which protection layer thicknesses are different from each other (i.e. the CD and the DVD). However, if is possible to construct the optical pickup apparatus 1 such that a plurality of standard voltages may be set for the comparator 12B, more than two types of the optical discs may be identified and a plurality of correction elements are exchanged in accordance with the identified types of the optical discs.

(2) Second Example

[0044] FIG. 4 shows a construction of an optical pickup apparatus as a second example, which is equipped in an optical disc player. In FIG. 4, constitutional elements same as those in the first example of FIG. 1 carry the same reference numerals and the explanation thereof are omitted.

[0045] As shown in FIG. 4, the construction of an optical pickup apparatus 60 is different from that of the first example of FIG. 1 in that a slit plate 61 for correcting a light intensity distribution in the tangential direction of the record track i.e. the disc rotation direction of the optical disc 101 is provided in place of the correction element 6 for correcting the spherical aberration in the first example. The slit plate 61 is driven by the driving mechanism 7 to move into and out of the optical path. Other constitutional elements of the second example are the same as those of the first example.

[0046] Next the operation of the optical pickup apparatus 60 will be described with referring to FIGS. 2A and 4 to 8.

[0047] In advance of the information reproduction operation, the optical pickup apparatus 60 closes the focus servo to get the reading light focussed on the information record plane of the optical disc 101.

[0048] By this, the low pass filter 12A passes only the low frequency component of the voltage signal corresponding to the electric current flowing through the focus coil for driving the objective lens 9 in the focussing direction, and outputs it as the low frequency component signal having the voltage Vdc to the comparator 12B in FIG. 2A. By this, the comparator 12B compares the voltage Vdc of the low frequency component signal with the standard voltage Vref and outputs the disc identification signal Sd corresponding to the identified type of the optical disc 101, which is loaded on the optical disc player in FIG. 2A.

[0049] In this case, it is assumed that the DVD is constructed to have a record track pitch smaller than that of the CD, and also have an information pit size smaller than that of the CD, so as to improve the information record density, and that the numerical aperture of the objective lens 9 is set to be optimum for the reproduction of the DVD.

[0050] By this, the control circuit 13 outputs the control signal Sc to the driving circuit 8 to control the moving in and out operation for the slit plate 61 on the basis of the disc identification signal Sd.

[0051] As a result, the driving circuit 8 outputs the driving control signal Sdr to the driving mechanism 7 on the basis of the control signal Sc, so as to move the slit plate 61 into and out of the optical path in accordance with the disc identification signal Sd.

[0052] More concretely, in the same manner as the first example shown in FIG. 3, when the disc identification signal Sd indicates the CD, the slit plat 61 is moved into the optical path if the slit plate 61 is not in the optical path, and is not moved but remains as it is if the slit plate 61 is already in the optical path as shown in FIG. 5. In FIG. 5, the objective lens 9 is actuated in the focussing direction by an actuator movable member 9a, and the slit plate 61 prescribes the width of the reading light incident to the objective lens 9 by the plate portion around the slit.

[0053] As a result, as shown in FIG. 6, the both edge portions of the pupil of the reading light beam, which is

applied onto the optical disc 101, in the tangential direction of the record track, is shadowed by the slit plate 61 as indicated by a shaded area 61 a on the optical disc 101. Thus, the light intensity distribution in the tangential direction of the record track upon reproducing the CD is corrected as shown in FIG. 7. At this time, as shown in FIG. 8, the reproduction signal after correction can be obtained by the reflection light from an information pit P, such that the distortion which would exists without the slit plate 61 is certainly corrected by the slit plate 61, according to the second example.

[0054] On the other hand, when the disc identification signal Sd indicates the DVD, the slit plate 61 is not moved but remains as it is if the slit plate 61 is not in the optical path and is moved out of the optical path 61 if the slit plate 61 is in the optical path.

[0055] As described above in detail, according to the second example, the light intensity distribution correction optimum for each size of the information pit of the loaded optical disc for each size of the information pit of the loaded optical disc is performed, so that the effect, which is substantially same as the case of correcting the numerical aperture NA of the objective lens, can be achieved. Thus, the optimum reproduction operation for the loaded optical disc can be easily performed.

[0056] In the above second example, the explanation has been made for the case of reproducing two types of the optical discs which protection layer thickness are different from each other (i.e. the CD and the DVD). However, it is possible to construct the optical pickup apparatus 60 such that a plurality of standard voltages are set to the comparator 12B of the disc identifying sensor 12, more than two types of the optical discs may be identified and a plurality of slit plates are exchanged in accordance with the identified types of the optical discs to perform the reproduction operation optimum for each optical disc.

(3) Third Example

[0057] In the above second example, the slit plate 61 is used for correcting the light intensity distribution. In a third example, a glass filter 71 shown in FIG. 9 for correcting the light intensity distribution is provided in place of the slit plate 61 in the construction shown in FIG. 4. As shown in FIG. 9, the glass filter 71 is constructed such that a coating layer is applied to both edge portions on a surface of a glass substrate so as to decrease the light transmissivity of the glass substrate at the edge portions thereof in the tangential direction of the record track. Other than that, the construction of the third example is the same as the second example.

[0058] According to the third example, the light intensity distribution correction optimum for each size of the information pit of the loaded optical disc is performed, so that the effect, which is substantially same as the case of correcting the numerical aperture NA of the objective lens, can be achieved. Thus, the optimum reproduction operation for the loaded optical disc can be easily performed in the same manner as the second example.

(4) Fourth Example

[0059] In the above third example, the glass filter 71 is used in place of the slit plate 61 in the construction of FIG. 4. In a fourth example, a correction element 81 shown in FIG. 10 having gratings for correcting the light intensity distribution is used in place of the slit plate 61 of FIG. 4. As shown in FIG. 10, the correction element 81 is constructed such that the gratings are provided at both edge portions of a glass substrate in the tangential direction of the record track of the optical disc 101. The grating direction of each grating of the correction element 81 is perpendicular to the tangential direction of the record track. Other than that, the construction of the fourth embodiment is the same as the second example.

[0060] By use of the correction element 81 having the gratings in this manner, the intensity of the zero order light beam, which has passed through each grating at the edge portions, is lower than that of the light beam, which has passed through a central portion of the correction element 81. Accordingly, the effect, which is substantially same as the case of correcting the numerical aperture NA of the objective lens, can be achieved. Thus, the optimum reproduction operation for the loaded disc can be easily performed in the same manner as the second example.

(5) Fifth Example

[0061] In the above fourth example, the grating direction of each grating of the correction element 81 is perpendicular to the tangential direction of the record track of the optical disc 101. In a fifth example, the grating direction of each grating of a correction element 91 is parallel to the tangential direction of the record track as shown in FIG. 11. Other than that, the construction of the correction element 91 in the fifth example is the same as the correction element 81 in the fourth example. In fact, the grating direction for this kind of correction element 81 or 91 can be freely designed.

(6) Sixth Example

[0062] In each of the above described second to fifth examples, the correction of the light intensity distribution is performed by mechanically inserting an optical element i.e. the slit place, the glass filter and the correction element having the grating into the optical path, so as to correct the light intensity distribution in the tangential direction of the record track. In contrast to this, an optical pickup apparatus 100 as a sixth example is constructed such that a correction element consisting of a liquid crystal shutter 110, which light transmissive amount can be electronically controlled by a shutter driving circuit 111

is fixed in the optical path, as shown in FIG. 12. In FIG. 12, constitutional elements same as those in the second example of FIG. 4 carry the same reference numerals and the explanation thereof are omitted.

[0063] In FIG. 12, the liquid crystal shutter 110 shuts both edge portions of the emitted reading light in the tangential direction of the record track such that a central portion of the emitted reading light in the tangential direction is transmitted through the liquid crystal shutter 110 when the liquid crystal shutter 110 is electrically driven by a shutter driving circuit 111 to shut. The shutter driving circuit 111 electrically drives the liquid crystal shutter 110 to shut in accordance with the disc identification signal Sd.

[0064] According to the sixth example, in addition to the advantageous effect of the second example, since the driving mechanism for the correction element is not necessary, the construction of the optical pickup apparatus 100 can be made simplified and the size of the optical pickup apparatus 100 can be made small.

(7) Seventh Example

[0065] In each of the above described second to sixth examples, the correction of the light intensity distribution is performed by a separate optical element exclusive for correcting the light intensity distribution i.e. the slit plate, the glass filter, the correction element having the grating and the correction element electrically functioning as the correction element. In contrast to this, an optical pickup apparatus 200 as a seventh example is constructed such that a separate correction element does not exist. Instead, by applying the coating layer or by forming the gratings on one of the optical elements disposed in the optical path between the laser diode 2 and the optical disc 101 i.e. the grating 3', the half mirror 4', the collimator lens 5' and the objective lens 9', the correction element for correcting the light intensity distribution is formed in one body with this one of the optical elements. In FIG. 13, the constitutional elements same as those in the second example of FIG. 4 carry the same reference numerals and the explanation thereof are omitted. In FIG.13, the optical element (the grating 3', the half mirror 4' the collimator lens 5' or the objective lens 9') formed in one body with the correction element is adapted to be exchanged, or electrically controlled so as to change the light transmissive property in the tangential direction of the record track in accordance with the identified type of the loaded optical disc 101.

[0066] According to the seventh example, in addition to the advantageous effect of the second example, since the separate correction element is not installed, the construction of the optical pickup apparatus 200 can be made simplified and the size of the optical pickup apparatus 200 can be made small.

Claims

1. An identification apparatus (12) for identifying a type of optical record medium (101) loaded on an information reproducing apparatus among at least first and second type optical record media which have distances from surfaces to information record planes different from each other, said information reproducing apparatus comprising: an objective lens (9) for focussing a reading light onto the information record plane of the loaded optical record medium; and a focus coil for driving said objective lens in a focussing direction, **characterised in that** said identification apparatus comprises:

a detection means for detecting a voltage corresponding to a current, which flows through the focus coil when a focussing condition is optimum, and outputting a voltage signal indicating the detected voltage;

a low pass filter (12A) for passing a low frequency component of the voltage signal and outputting a low frequency component signal; and

a comparison means (12B) for comparing a voltage of the low frequency component signal with at least one standard voltage, which is set in advance based on the distances from the surfaces to the information record planes of said first and second optical record media, and for outputting an disc identification signal, which indicates the type of said loaded optical record medium, on the basis of a result of comparing.

Patentansprüche

1. Ein Identifizierungsgerät (12) zum Identifizieren des Typs eines optischen Aufzeichnungsmediums (101), das in ein Informationswiedergabegerät eingelegt ist, unter wenigstens einem ersten Typ und einem zweiten Typ eines optischen Aufzeichnungsmediums, die unterschiedliche Abstände von der Oberfläche zur Informationsaufzeichnungsebene haben, wobei das genannte Informationswiedergabegerät umfasst: eine Objektivlinse (9), um ein Lesellicht auf die Informationsaufzeichnungsebene des eingelegten optischen Aufzeichnungsmediums zu fokussieren; und eine Fokusspule, um die genannte Objektivlinse in eine Fokussierrichtung anzutreiben, dadurch charakterisiert, dass das genannte Identifizierungsgerät umfasst:

eine Nachweiseinrichtung, um eine Spannung nachzuweisen, die einem Strom entspricht, der durch die Fokusspule fließt wenn die Fokussierbedingungen optimal sind, und ein Spannungssignal ausgibt, das die nachgewiesene

Spannung anzeigt;
einen Tiefpassfilter (12A), um eine niederfrequente Komponente des Spannungssignals durchzulassen und ein Signal der niederfrequenten Komponente auszugeben; und
eine Vergleichseinrichtung (12B), um eine Spannung des Signals der niederfrequenten Komponente mit wenigstens einer Standardspannung zu vergleichen, die basierend auf dem Abstand von der Oberfläche zur Informationsaufzeichnungsebene des genannten ersten und zweiten Aufzeichnungsmediums voreingestellt ist, und um ein Disc-Identifikationssignal auszugeben, das aufgrund des Resultats des Vergleichs den Typ des eingelegten optischen Aufzeichnungsmediums anzeigt.

Revendications

1. Appareil d'identification (12) pour identifier un type de support d'enregistrement optique (101) qui est chargé sur un appareil de reproduction d'information parmi au moins des supports d'enregistrement de premier et second types qui présentent des distances depuis des surfaces jusqu'à des plans d'enregistrement d'information différentes l'une de l'autre, ledit appareil de reproduction d'information comprenant :

   un objectif (9) pour focaliser une lumière de lecture sur le plan d'enregistrement d'information du support d'enregistrement optique chargé ; et
   une bobine de focalisation pour piloter ou entraîner ledit objectif suivant une direction de focalisation,

   caractérisé en ce que ledit appareil d'identification comprend :

   un moyen de détection pour détecter une tension qui correspond à un courant, lequel courant circule au travers de la bobine de focalisation lorsqu'une condition de focalisation est optimum, et pour émettre en sortie un signal de tension qui représente la tension détectée ;
   un filtre passe-bas (12A) pour laisser passer une composante basse fréquence du signal de tension et pour émettre en sortie un signal de composante basse fréquence ; et
   un moyen de comparaison (12B) pour comparer une tension du signal de composante basse fréquence à au moins une tension standard qui est établie à l'avance sur la base des distances depuis les surfaces jusqu'aux plans d'enregistrement d'information desdits premier et second supports d'enregistrement optique et pour émettre en sortie un signal d'identification de disque qui indique le type dudit support d'enregistrement optique chargé, sur la base d'un résultat de comparaison.

FIG. 1

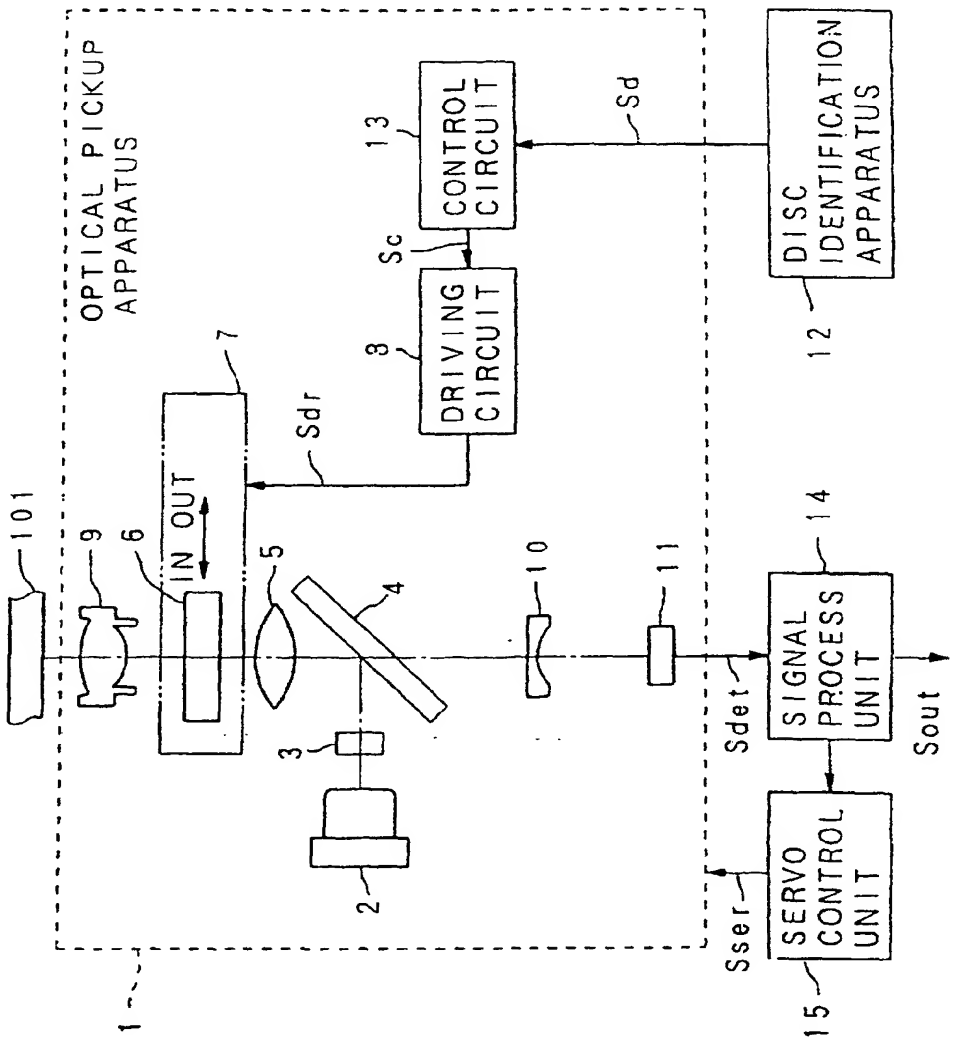
OPTICAL PICKUP
APPARATUS
101
9
6
IN OUT
5
4
7
Sdr
3
DRIVING
CIRCUIT
Sc
13
CONTROL
CIRCUIT
Sd
DISC
IDENTIFICATION
APPARATUS
12
10
11
2
3
1
Sdet
SIGNAL
PROCESS
UNIT
14
Sout
SERVO
CONTROL
UNIT
15
Sser

FIG. 2A

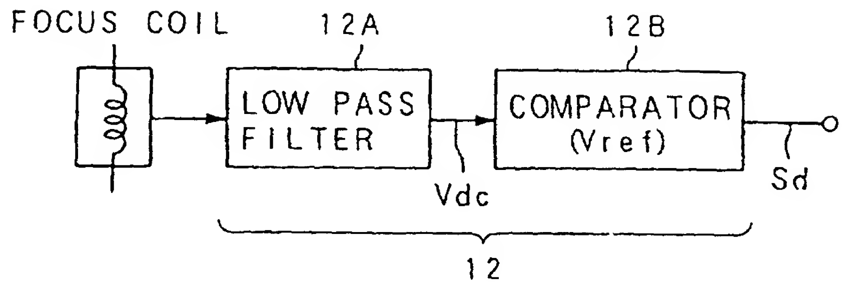

FIG. 2B

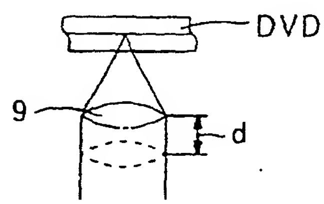

FIG. 2C

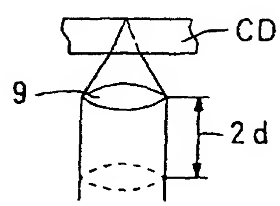

FIG. 3

		DISC TYPE	
		CD	DVD
ABERRATION CORRECTION ELEMENT	OUT OF OPTICAL PATH	AS IT IS	MOVE IN
	IN OPTICAL PATH	MOVE OUT	AS IT IS

FIG. 4

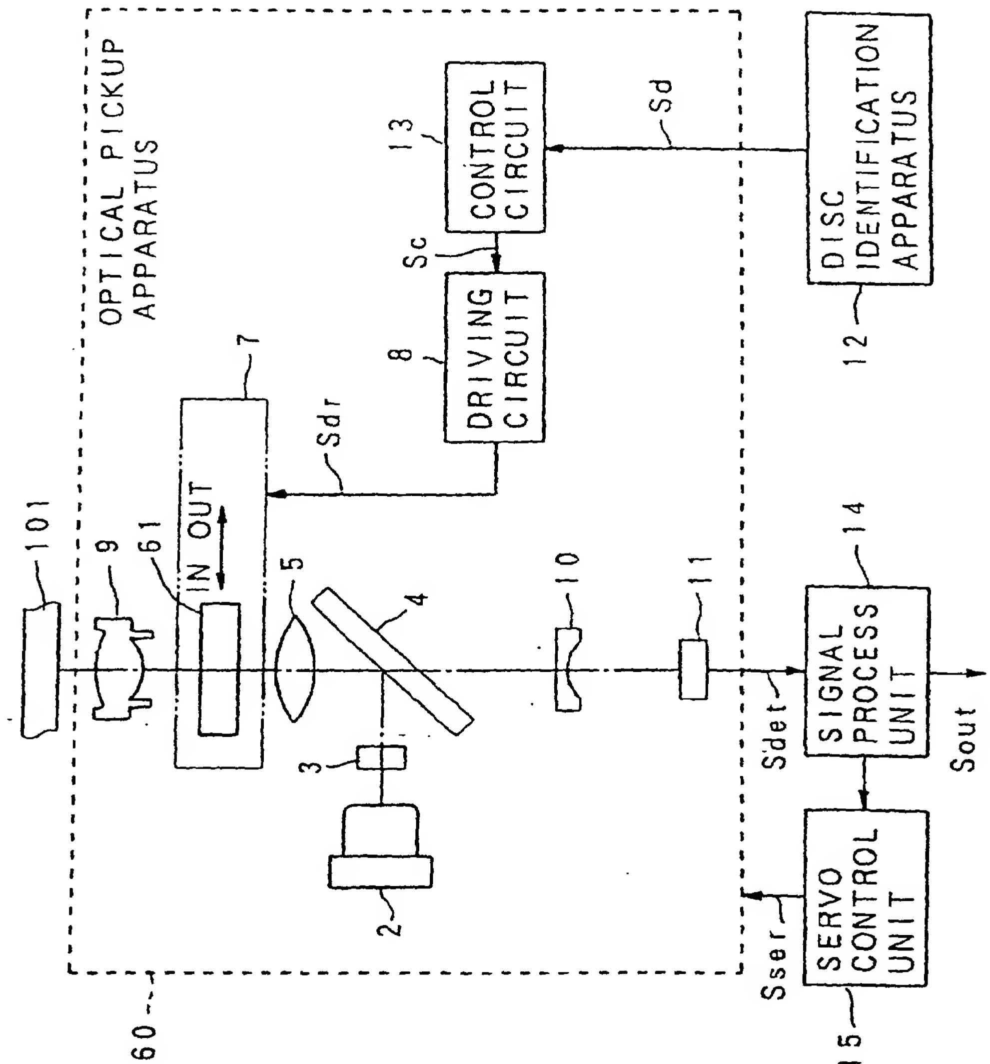
OPTICAL PICKUP APPARATUS
101
9
61
IN OUT
5
4
7
Sdr
8
DRIVING CIRCUIT
Sc
13
CONTROL CIRCUIT
Sd
DISC IDENTIFICATION APPARATUS
12
10
11
14
SIGNAL PROCESS UNIT
Sdet
Sout
3
2
60
Sser
SERVO CONTROL UNIT
15

FIG. 5

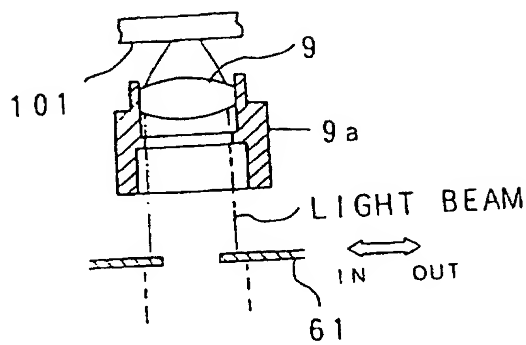
9
101
9a
LIGHT BEAM
IN
OUT
61

FIG. 6

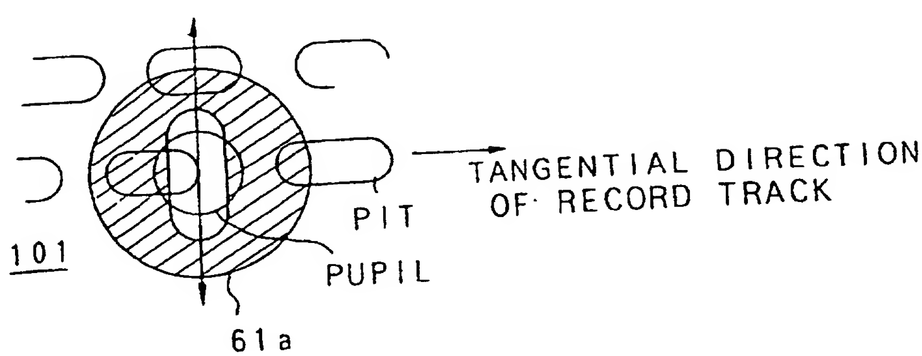
TANGENTIAL DIRECTION
OF RECORD TRACK
PIT
101
PUPIL
61a

FIG. 7

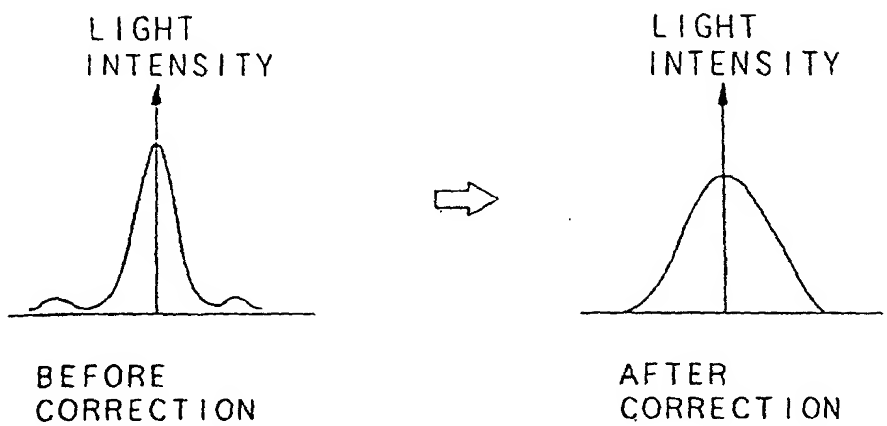
LIGHT
INTENSITY
BEFORE
CORRECTION
LIGHT
INTENSITY
AFTER
CORRECTION

FIG. 8

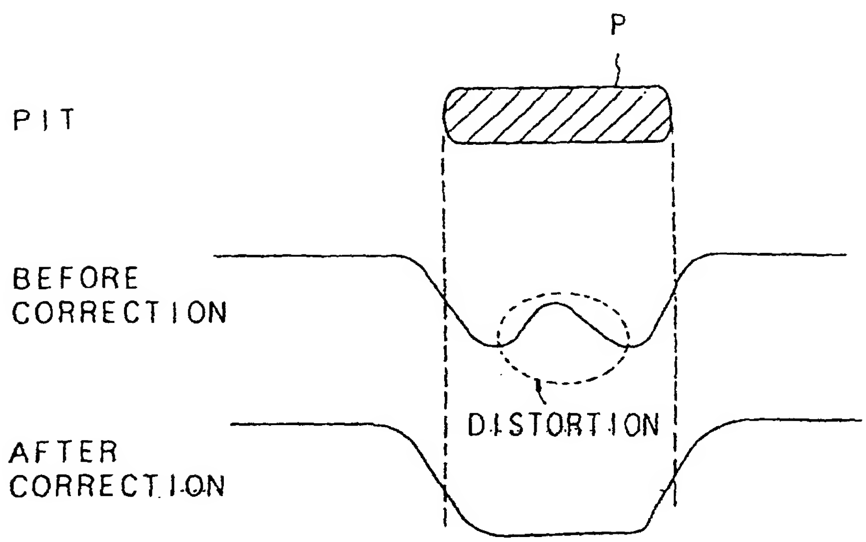

FIG. 9

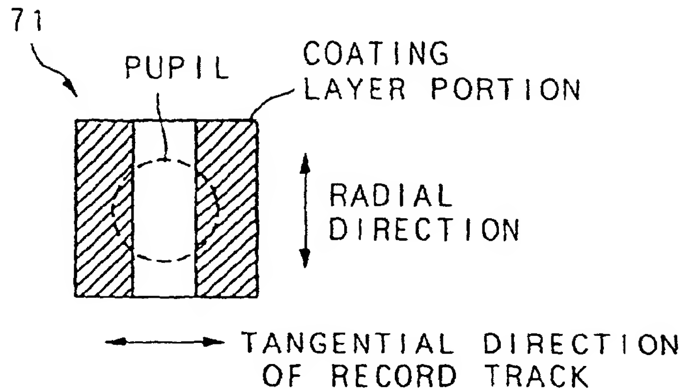

FIG. 10

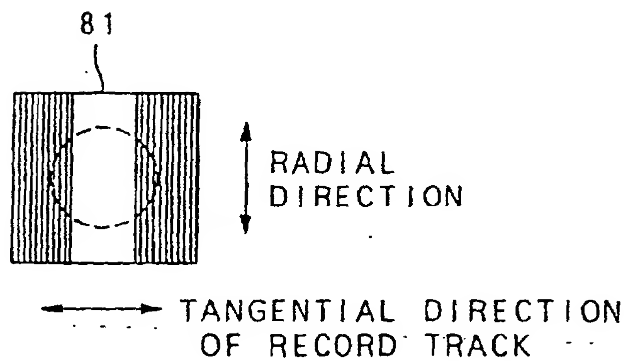

FIG. 11

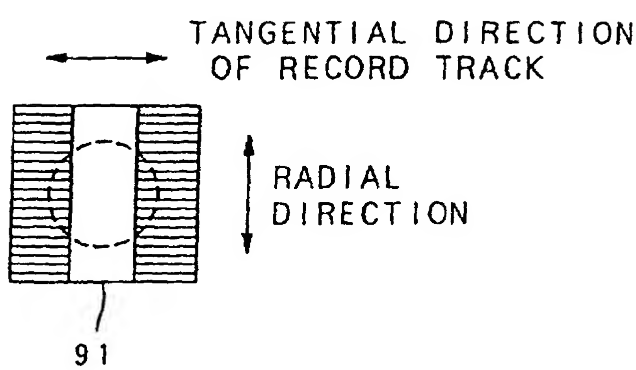

FIG. 12

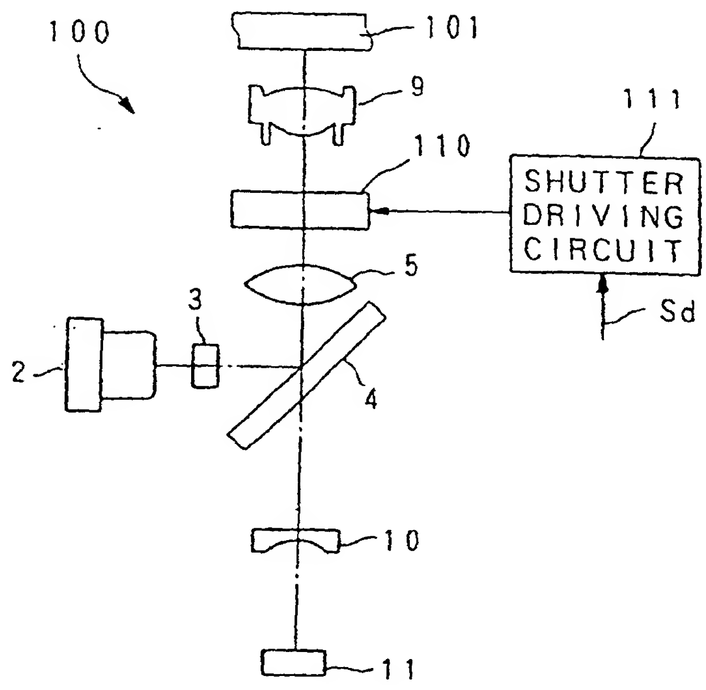

FIG. 13